OUTPUT PENTODE

EL34

Output pentode rated for 25W anode dissipation, intended for use in a.c. mains operated equipment.

HEATER

V_h		6.3	V
I_h		1.5	A

CAPACITANCES

c_{out}	8.4	pF
c_{in}	15.2	pF
c_{a-g1}	<1.0	pF
c_{g1-h}	<1.0	pF
c_{h-k}	11	pF

CHARACTERISTICS   ←

Pentode connection

V_a	250	V
V_{g2}	250	V
V_{g3}	0	V
I_a	100	mA
I_{g2}	15	mA
V_{g1}	−12.2	V
g_m	11	mA/V
r_a	15	kΩ
μ_{g1-g2}	11	
V_{g1} max. ($I_{g1} = +0.3\mu A$)	−1.3	V

Triode connection
(g2 connected to a)

V_a	250	V
I_a	70	mA
V_{g1}	−15.5	V
g_m	11.5	mA/V
r_a	910	Ω
μ	10.5	

OPERATING CONDITIONS AS SINGLE VALVE CLASS "A" AMPLIFIER

Pentode connection

V_a	250	300	V
V_{g2}	250	300	V
V_{g3}	0	0	V
R_k	106	190	Ω
R_a	2.0	3.5	kΩ
I_a	100	83	mA
I_{g2}	15	13	mA
$V_{in(r.m.s.)}$ (P_{out} = 50mW)	500	450	mV
$V_{in(r.m.s.)}$	8.0	8.2	V
*P_{out}	11	11	W
*D_{tot}	10	10	%

*P_{out} and D_{tot} are measured at fixed bias and therefore represent the power output available during the reproduction of speech and music. When a sustained sine wave is applied to the control-grid the bias across the cathode resistor will readjust itself as a result of the increased anode and screen-grid currents. This will result in a reduction in power output of approximately 10%.

OPERATING CONDITIONS FOR TWO VALVES IN PUSH-PULL

Distributed load conditions for maximum output (screen-grid tapping at 20% of primary turns)

V_b	450	V
R_{g2} (per valve)	1.0	kΩ
R_k (per valve)	500	Ω
R_{a-a}	7.0	kΩ
$I_{a(o)}$	2×55	mA←
$I_{g2(o)}$	2×9.0	mA←
$V_{in(g1-g1)r.m.s.}$	55.2	V
P_{out}	40	W
D_{tot}	4.5	%
$I_{a(max. sig.)}$	2×74	mA
$I_{g2(max. sig.)}$	2×9.0	mA

Distributed load conditions for minimum distortion (with screen-grid tapping at 43% of primary turns)

V_b	430	430	V
R_{g2} (per valve)	1.0	1.0	kΩ
R_k (per valve)	470	470	Ω
R_{a-a}	6.0	6.0	kΩ
$I_{a(o)}$	2×62.5	2×62.5	mA
$I_{g2(o)}$	2×10	2×10	mA
$V_{in(g1-g1)r.m.s.}$	35	50	V
P_{out}	20	34	W
D_{tot}	0.35	2.5	%
$I_{a (max. sig.)}$	2×65	2×70	mA
$I_{g2(max. sig.)}$	2×10.2	2×14	mA

OPERATING CONDITIONS FOR TWO VALVES IN PUSH-PULL

Fixed bias

V_b	375	400	V
V_{g3}	0	0	V
*R_{g2}	600	800	Ω
V_{g1}	−33	−36	V
R_{a-a}	3.5	3.5	kΩ
$I_{a(o)}$	2×30	2×30	mA
$I_{g2(o)}$	2×4.7	2×4.5	mA
$V_{in(g1-g1)r.m.s.}$	46.7	50	V
P_{out}	48	54	W
D_{tot}	2.8	1.6	%
$I_{a(max. sig.)}$	2×107.5	2×110.5	mA
$I_{g2 (max. sig.)}$	2×23.5	2×23	mA

*Screen-grid resistor common to both valves.

EL34

Cathode bias

V_b	375	450	V
V_{g3}	0	0	V
*R_{g2}	0.47	1.0	kΩ
R_k (per valve)	260	465	Ω
R_{a-a}	3.5	6.5	kΩ
$I_{a(o)}$	2×75	2×60	mA
$I_{g2(o)}$	2×12.5	2×10	mA
$V_{in(g1-g1)r.m.s.}$	40	54	V
P_{out}	35	40	W
D_{tot}	1.7	5.1	%
$I_{a(max. sig.)}$	2×94	2×71.5	mA
$I_{g2(max. sig.)}$	2×19.5	2×22	mA

*Screen-grid resistor common to both valves.

OPERATING CONDITIONS FOR TWO VALVES IN PUSH-PULL

Triode connection (g_2 connected to a, g_3 to k) with separate cathode bias resistors.

With R_k bypassed

V_b	430	V
V_a	400	V
V_{g3}	0	V
R_k (per valve)	440	Ω
R_{a-a}	5.0	kΩ
$I_{a(o)}$	2×70	mA
$V_{in(g1-g1)r.m.s.}$	48	V
P_{out}	19	W
D_{tot}	1.8	%
$I_{a(max. sig.)}$	2×75	mA

With R_k unbypassed

V_b	430	V
V_a	400	V
V_{g3}	0	V
R_k (per valve)	440	Ω
R_{a-a}	10	kΩ
$I_{a(o)}$	2×70	mA
$V_{in(g1-g1)r.m.s.}$	48	V
P_{out}	14	W
D_{tot}	0.4	%
$I_{a(max. sig.)}$	2×73	mA

OPERATING CONDITIONS FOR TWO VALVES IN PUSH-PULL WITH CONTINUOUS SINE WAVE DRIVE

Fixed bias

V_b	375	400	V
V_{g3}	0	0	V
R_{g2}	1.0	1.5	kΩ
V_{g1}	-32	-35.5	V
R_{a-a}	3.5	3.5	kΩ
$I_{a(o)}$	2×30	2×30	mA
$I_{g2(o)}$	2×4.4	2×4.4	mA
$V_{in(g1-g1)r.m.s.}$	45	50	V
P_{out}	42	51	W
D_{tot}	3.0	1.8	%
$I_{a(max. sig.)}$	2×98	2×106	mA
$I_{g2(max. sig.)}$	2×19	2×21	mA

Cathode bias

Any of the cathode bias conditions published in this data sheet are suitable for continuous sine wave drive.

DESIGN CENTRE RATINGS

$V_{a(b)}$ max.	2.0	kV
V_a max.	800	V
p_a max.	25	W
$V_{g2(b)}$ max.	800	V
V_{g2} max.	500	V
p_{g2} max.	8.0	W
I_k max.	150	mA
R_{g1-k} max.	500	kΩ
V_{h-k} max.	100	V
R_{h-k} max.	20	kΩ

Triode connected

V_a max.	600	V
p_{a+g2} max. ($V_a = 500V$)	30	W
p_{a+g2} max. ($V_a = 600V$)	15	W

6299

a

g3

g1

g2

kh   h

g2   g1

a   NC

h   h

g3   k

Octal Base

All dimensions in mm
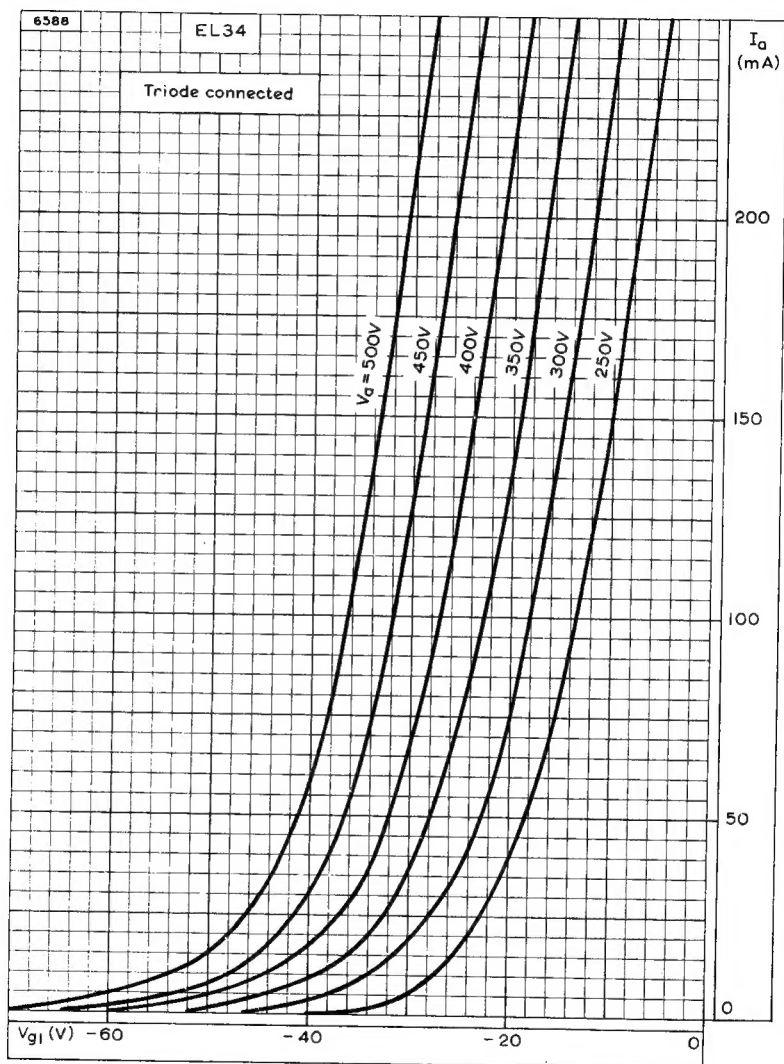
33·3
max

98 max

112 max

EL34
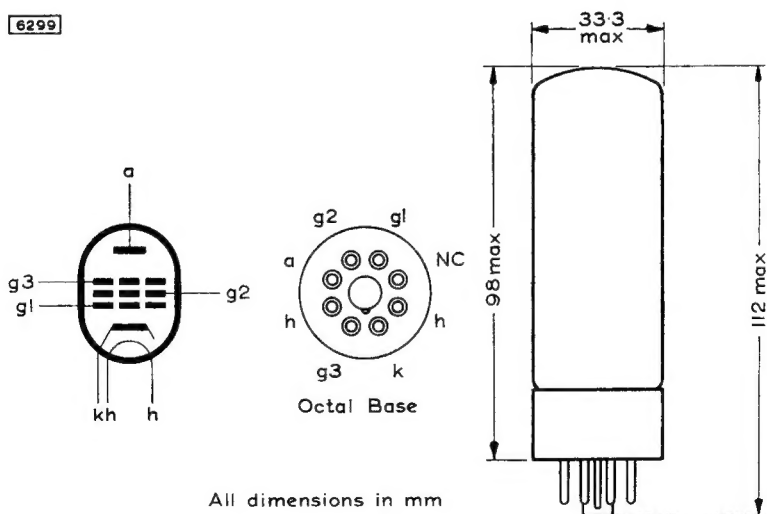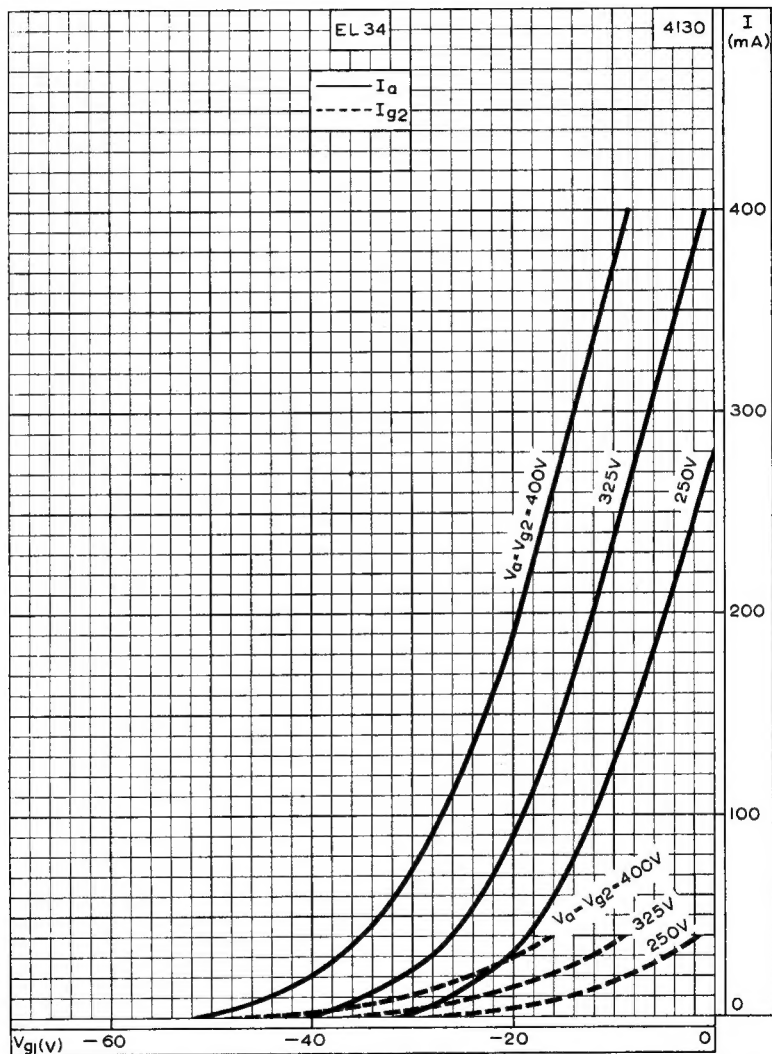
ANODE AND SCREEN-GRID CURRENTS PLOTTED AGAINST CONTROL-GRID VOLTAGE WITH ANODE AND SCREEN-GRID VOLTAGES AS PARAMETERS
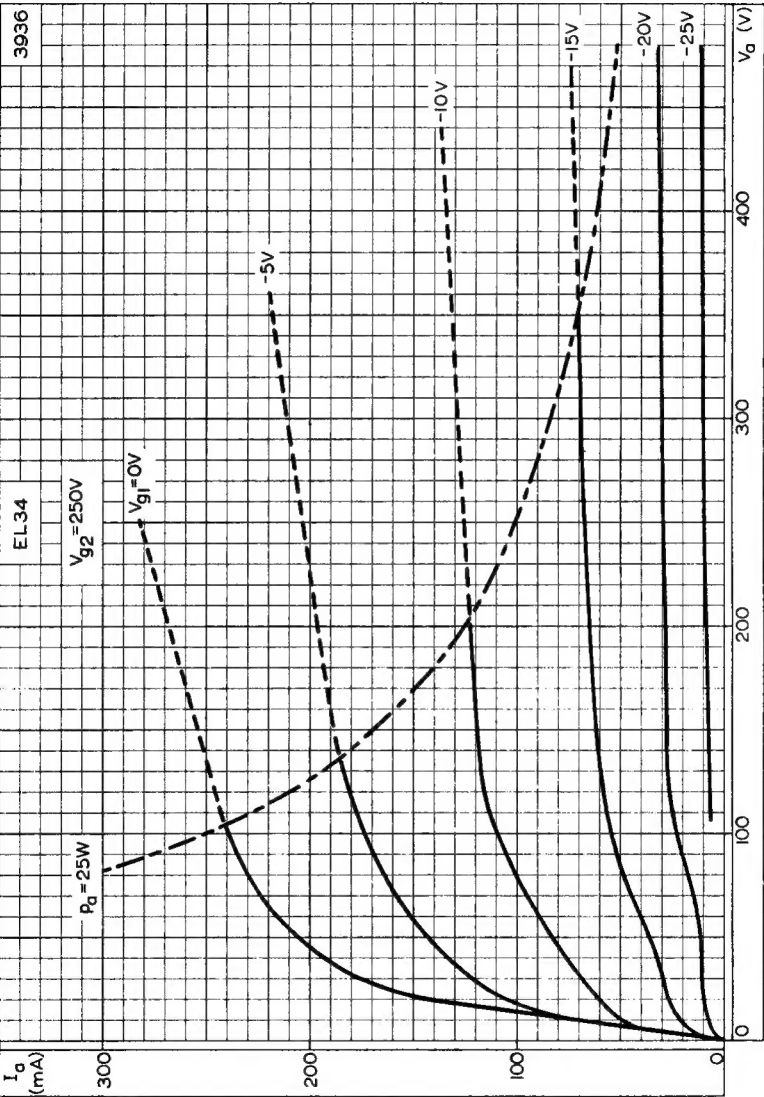
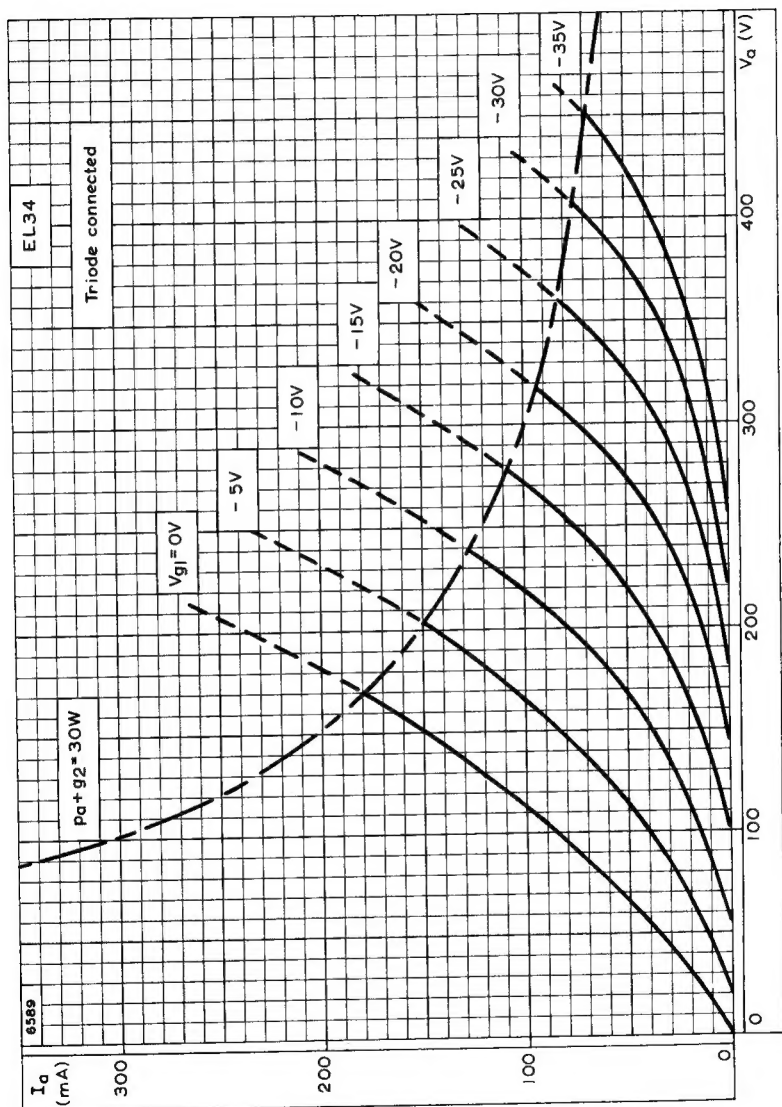ANODE CURRENT PLOTTED AGAINST ANODE VOLTAGE WITH
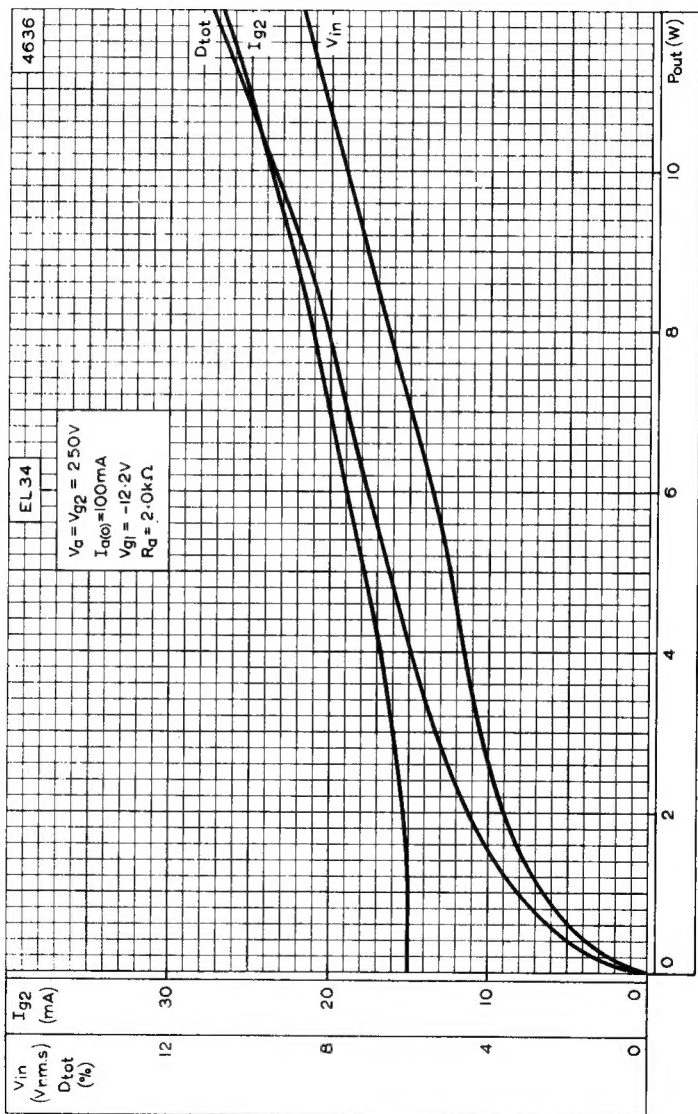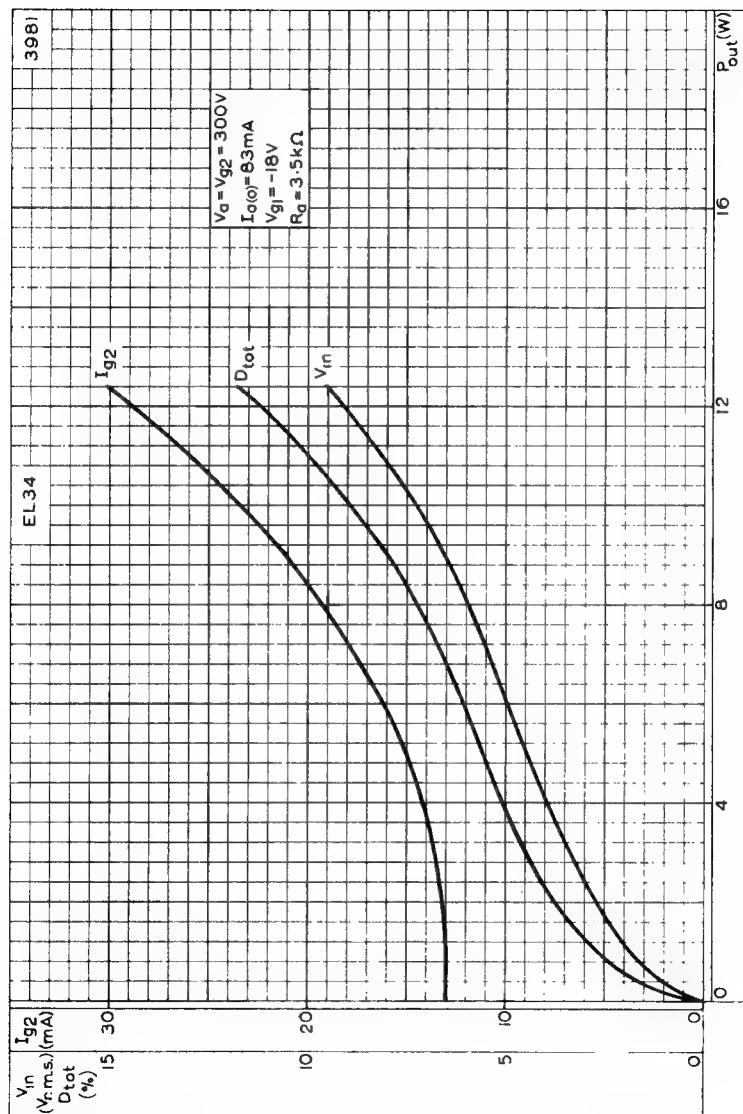CONTROL-GRID VOLTAGE AS PARAMETER

EL34

6588

EL34

Triode connected

$V_a = 500V$ 450V 400V 350V 300V 250V

I_a (mA)

200

150

100

50

0

V_{g1} (V) −60 −40 −20 0

ANODE CURRENT PLOTTED AGAINST CONTROL-GRID VOLTAGE WITH
ANODE VOLTAGE AS PARAMETER WHEN TRIODE CONNECTED
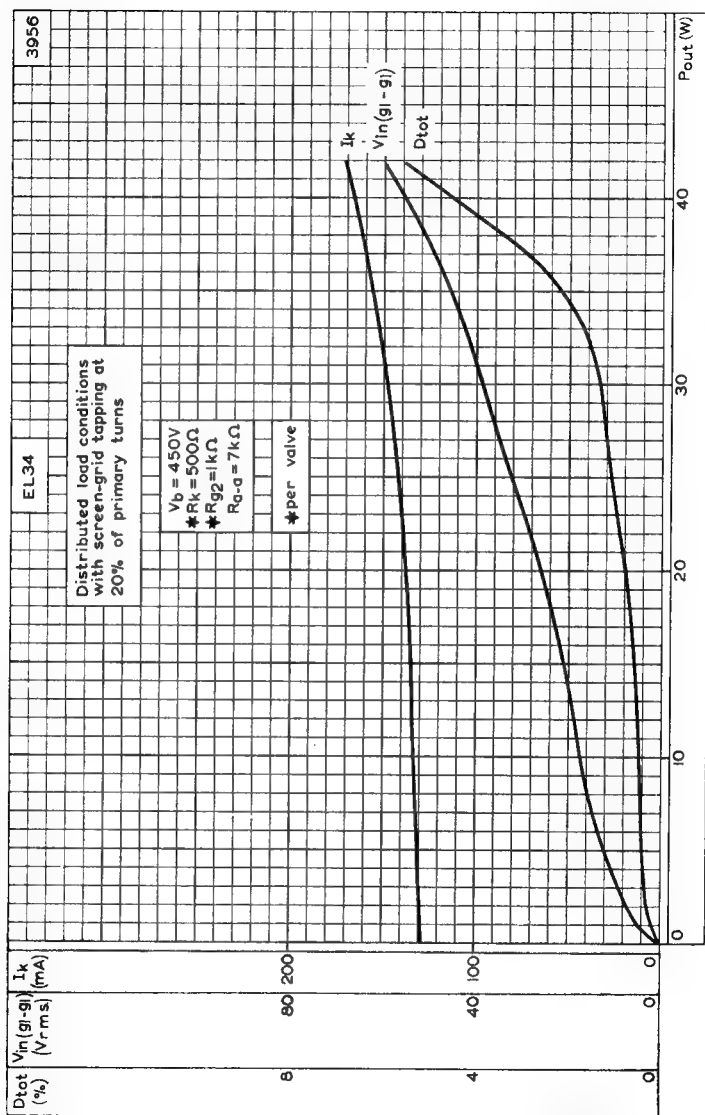
Mullard

ANODE CURRENT PLOTTED AGAINST ANODE VOLTAGE WITH CONTROL-GRID VOLTAGE AS PARAMETER WHEN TRIODE CONNECTED

PERFORMANCE OF EL34 WHEN USED AS A SINGLE VALVE
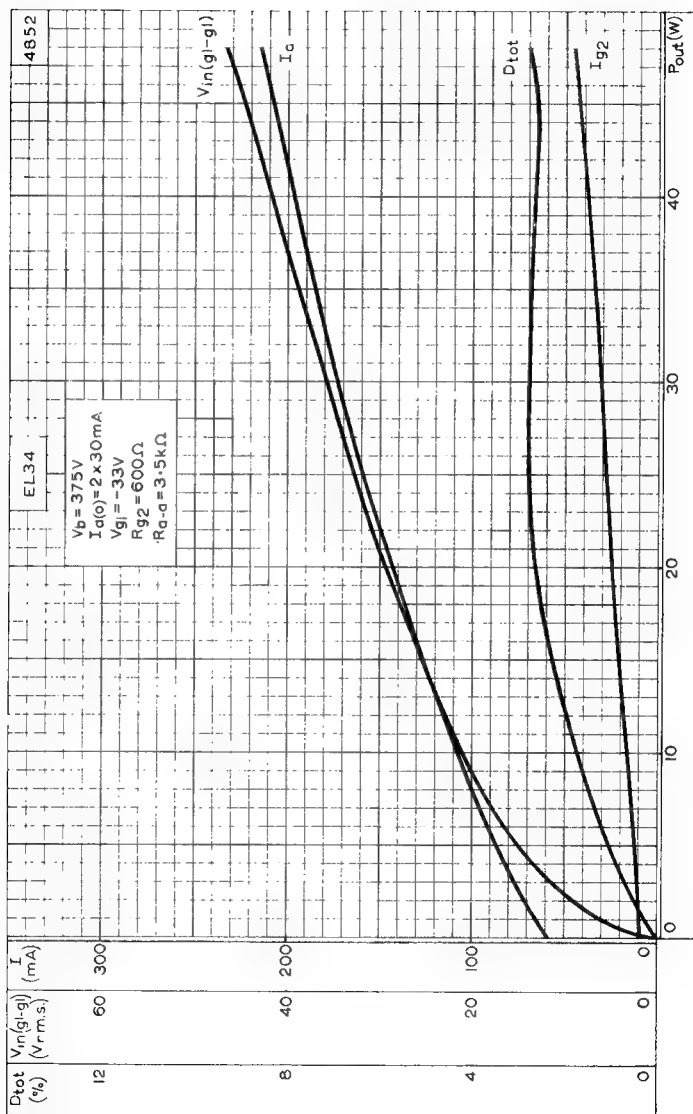CLASS 'A' AMPLIFIER. $V_a = 250V$

Chart annotations:
4636
D_{tot}
I_{g2}
V_{in}
P_{out} (W)

EL34
$V_a = V_{g2} = 250V$
$I_{a(o)} = 100mA$
$V_{g1} = -12.2V$
$R_a = 2.0k\Omega$

I_{g2} (mA): 30, 20, 10, 0
V_{in} (Vr.m.s) D_{tot} (%): 12, 8, 4, 0

Graph labels:

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$P_{out}(W)$

EL34

$V_a = V_{g2} = 300V$
$I_{a(o)} = 63mA$
$V_{g1} = -18V$
$R_a = 3.5k\Omega$

I_{g2}

D_{tot}

V_{in}

V_{in} (V.r.m.s.)
D_{tot} (%)
I_{g2} (mA)

PERFORMANCE OF EL34 WHEN USED AS A SINGLE VALVE
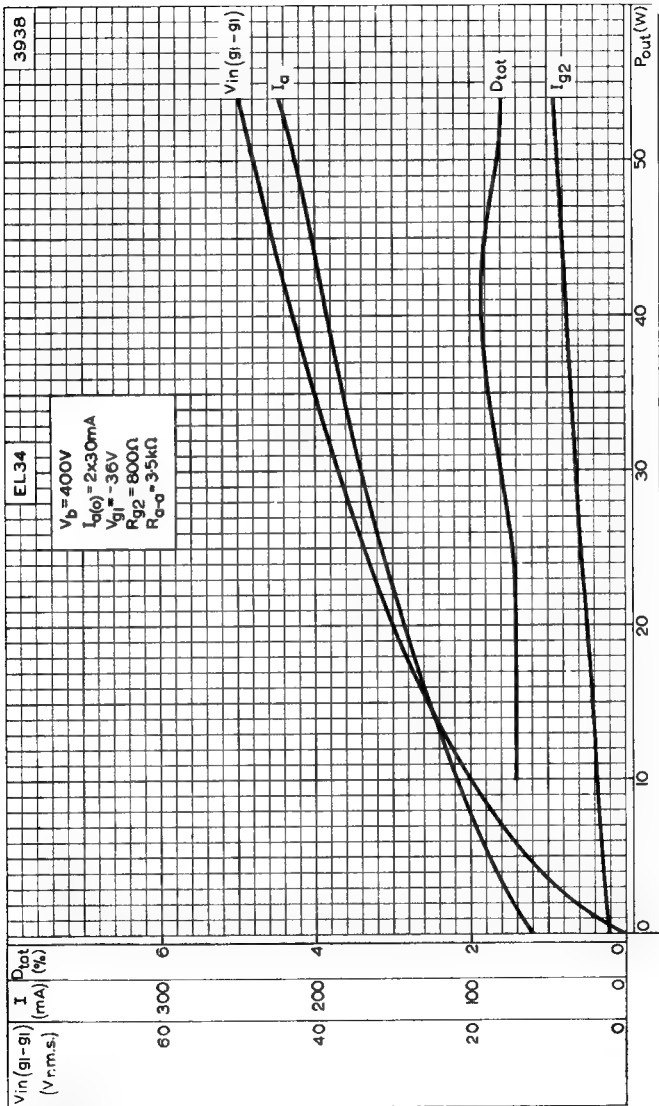CLASS 'A' AMPLIFIER. $V_a = 300V$

Mullard
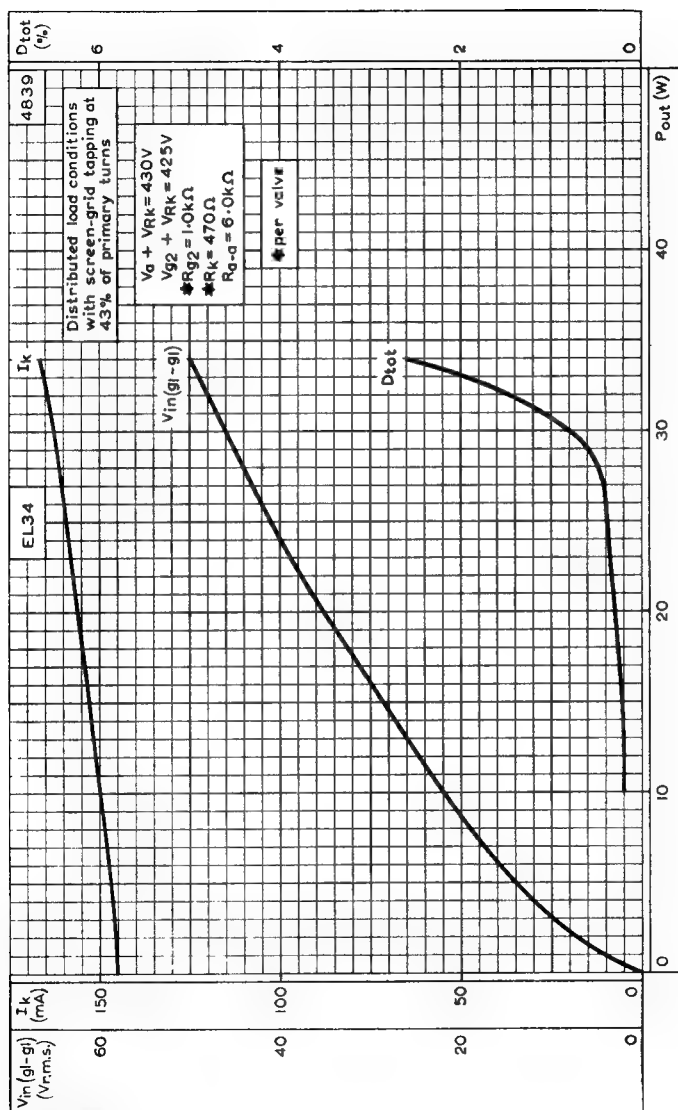
EL34

PERFORMANCE OF TWO EL34 IN PUSH-PULL WITH DISTRIBUTED LOAD
CONDITIONS. SCREEN-GRID TAPPING AT 20% OF PRIMARY TURNS

PERFORMANCE OF TWO EL34 IN PUSH-PULL WITH DISTRIBUTED LOAD
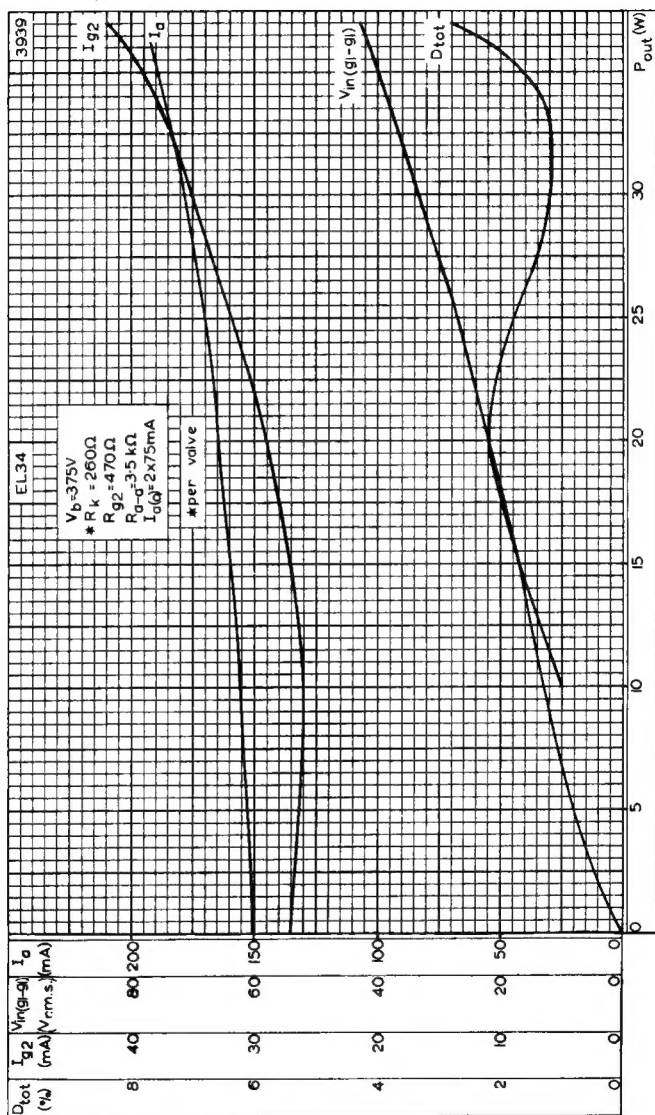CONDITIONS. SCREEN-GRID TAPPING AT 43% OF PRIMARY TURNS

Distributed load conditions with screen-grid tapping at 43% of primary turns

$V_a + V_{Rk} = 430V$
$V_{g2} + V_{Rk} = 425V$
*$R_{g2} = 1.0k\Omega$
*$R_k = 470\Omega$
$R_{a-a} = 6.0k\Omega$

*per valve

EL34

EL34

Vb = 375V
Ia(o) = 2×30mA
Vgl = −33V
Rg2 = 600Ω
Ra-a = 3·5kΩ

4852

PERFORMANCE OF TWO EL34 IN PUSH-PULL WITH FIXED BIAS
$V_b = 375V$

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Vin(g₁−g₁)

I_a

D_tot

I_g2

P_out(w)

EL34

$V_b = 400V$
$I_{a(o)} = 2 \times 30mA$
$V_{g1} = -36V$
$R_{g2} = 800\Omega$
$R_{a-a} = 3.5k\Omega$
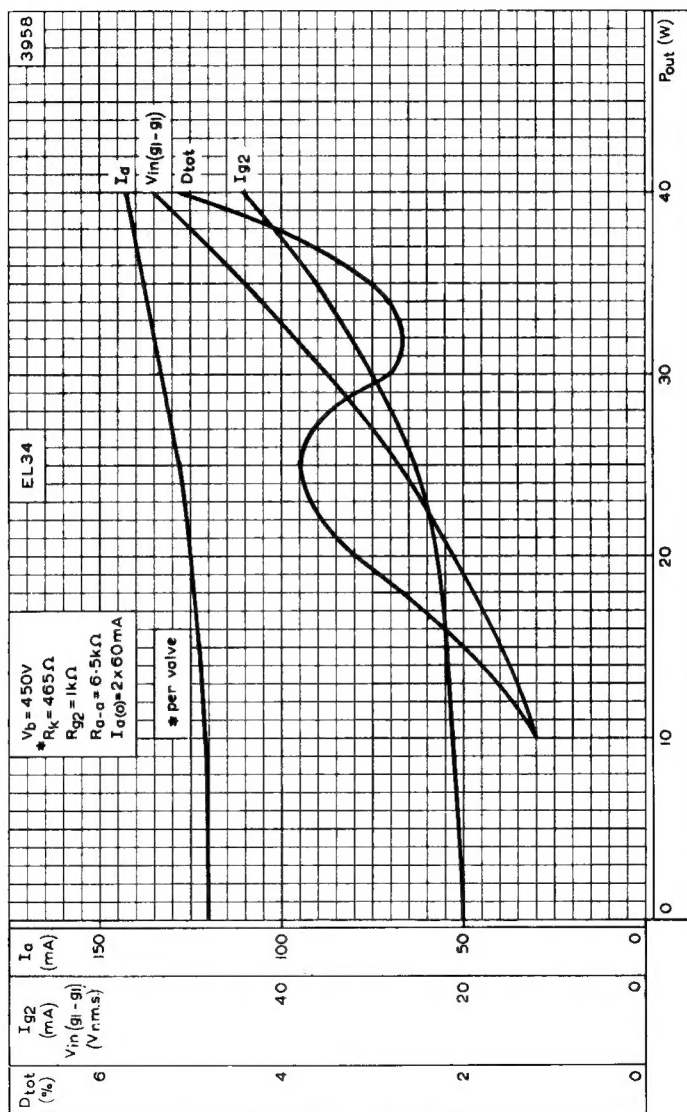
D_tot (%)

I (mA)

Vin(g₁−g₁) (v.r.m.s.)

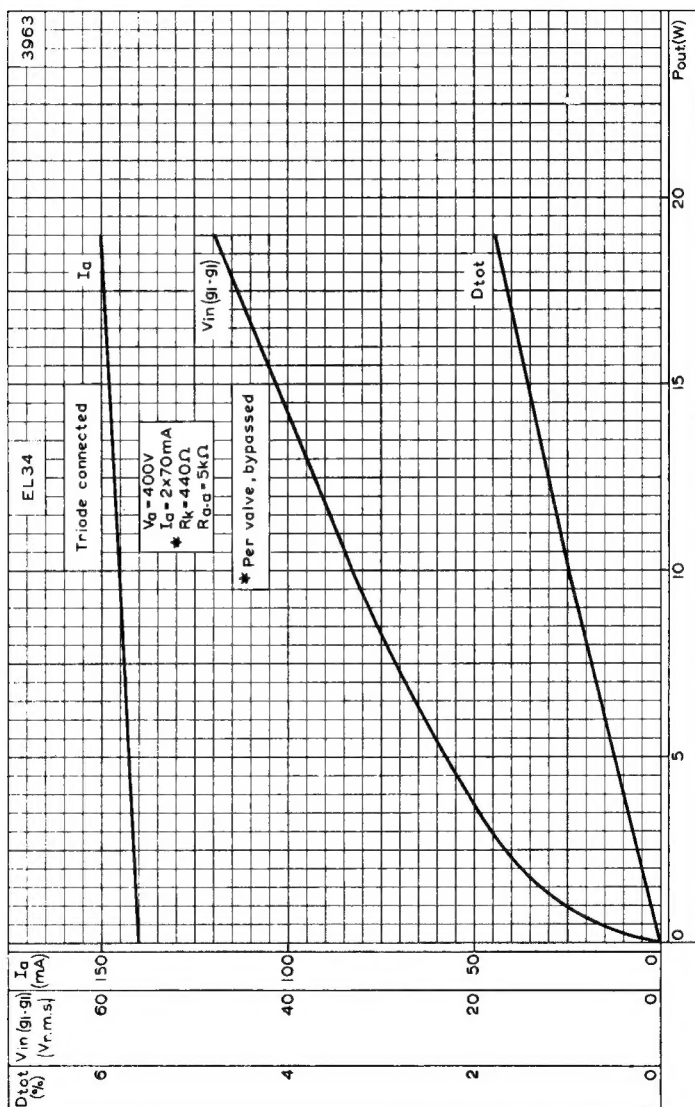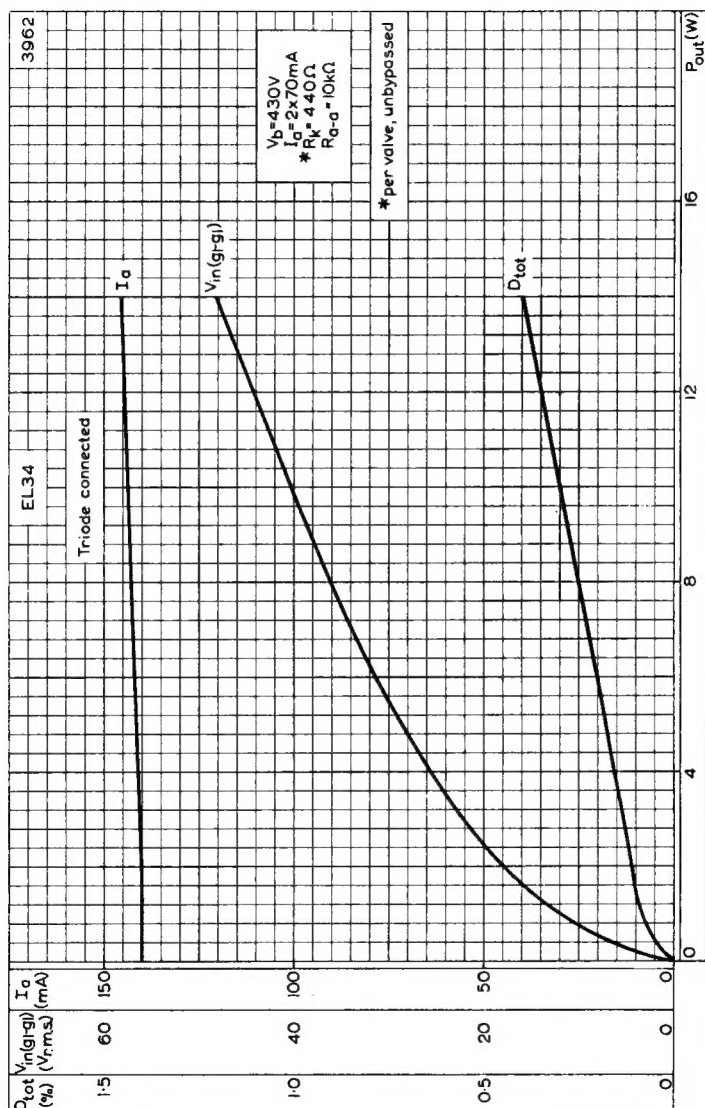PERFORMANCE OF TWO EL34 IN PUSH-PULL WITH FIXED BIAS
$V_b = 400V$

Mullard

PERFORMANCE OF TWO EL34 IN PUSH-PULL WITH CATHODE BIAS
$V_b = 375V$

PERFORMANCE OF TWO EL34 IN PUSH-PULL WITH CATHODE BIAS
$V_b = 450V$

EL34

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EL34

Triode connected

$V_a = 400V$
$I_a = 2 \times 70mA$
$* R_k = 440\Omega$
$R_{a-a} = 5k\Omega$

$* $ Per valve, bypassed

Ia

Vin(g1-g1)

Dtot

Pout(W)

I_a (mA)

V_{in} (g1-g1) (Vr.m.s.)

D_{tot} (%)

PERFORMANCE OF TWO EL34 IN PUSH-PULL WHEN TRIODE CONNECTED AND THE CATHODE BYPASSED

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EL34

Triode connected

$V_b = 430V$
$I_a = 2 \times 70mA$
$*R_k = 440\Omega$
$R_{a-a} = 10k\Omega$

*per valve, unbypassed

I_a

$V_{in(g-g)}$

D_{tot}

$P_{out}(W)$

I_a (mA)		150
		100
		50
		0
$V_{in(g-g)}$ (V r.m.s.)		60
		40
		20
		0
D_{tot} (%)		1·5
		1·0
		0·5
		0

PERFORMANCE OF TWO EL34 IN PUSH-PULL WHEN TRIODE CONNECTED AND THE CATHODE UNBYPASSED